

**PCT**

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>5</sup> :</b> <b>A61K 9/06, 9/00 // A61K 31/135</b> <b>A61K 31/19, 31/21</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 90/02545</b> <b>(43) International Publication Date:</b> 22 March 1990 (22.03.90)
<b>(21) International Application Number:</b> PCT/SE89/00462 <b>(22) International Filing Date:</b> 1 September 1989 (01.09.89)  <b>(30) Priority data:</b> 8803087-9                      2 September 1988 (02.09.88)    SE  <b>(71) Applicants:</b> AMSU, LTD. [GB/GB]; Philips Street, St. Helier, Jersey (GB). HAGGREN, Johan [SE/SE]; Advokatfirman Cederquist, Sveavägen 17, S-111 57 Stockholm (SE).  <b>(72) Inventors:</b> KOCK, Nils, G. ; Apotekaregatan 3, S-413 19 Göteborg (SE). LYCKE, Gerhard ; Annikas Gata 4, S-421 67 Västra Frölunda (SE).  <b>(74) Agents:</b> BERGVALL, Stina, Lena et al.; Dr. Ludwig Brann Patentbyrå AB, P.O. Box 7524, S-103 92 Stockholm (SE).		<b>(81) Designated States:</b> AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), DK, FI, FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), NO, SE (European patent).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> COMPOSITION FOR THE TREATMENT OF ERECTILE DYSFUNCTION  <b>(57) Abstract</b>  Lipophilic active substance composition and its use in a new method of treating erectile dysfunction by administration thereof, optionally together with a hydrophilic vehicle and optionally an antibacterial agent into the urethra.		

***FOR THE PURPOSES OF INFORMATION ONLY***

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MG	Madagascar
AU	Australia	FI	Finland	ML	Mali
BB	Barbados	FR	France	MR	Mauritania
BE	Belgium	GA	Gabon	MW	Malawi
BF	Burkina Faso	GB	United Kingdom	NL	Netherlands
BG	Bulgaria	HU	Hungary	NO	Norway
BJ	Benin	IT	Italy	RO	Romania
BR	Brazil	JP	Japan	SD	Sudan
CA	Canada	KP	Democratic People's Republic of Korea	SE	Sweden
CF	Central African Republic	KR	Republic of Korea	SN	Senegal
CG	Congo	LI	Liechtenstein	SU	Soviet Union
CH	Switzerland	LK	Sri Lanka	TD	Chad
CM	Cameroon	LU	Luxembourg	TG	Togo
DE	Germany, Federal Republic of	MC	Monaco	US	United States of America
DK	Denmark				

### COMPOSITION FOR THE TREATMENT OF ERECTILE DYSFUNCTION

This invention relates to a lipophilic active substance composition and its use in a new method of treating erectile dysfunction by administration thereof, optionally together with a hydrophilic vehicle and optionally an antibacterial agent into the urethra.

Normal erection activity involves the coordination of a complex series of physiological and psychological factors. Anything that affects any one of these systems can cause impotence. Psychogenic impotence can be caused by e.g. anxiety, depression, tension and stress.

Physical impotence occurs when diseases or injury affects the nerves, blood vessels or hormones that control erectile ability. The major causes of physical impotence in the United States are diabetes mellitus, vascular diseases, impotence following radical surgery, spinal cord injury and other traumas, other endocrine problems and multiple sclerosis. Other causes include prostate infections, drug abuse, alcoholism and side effects of prescription medicines. Even smoking can interfere with normal erections.

It is estimated that about 10 million men in the United States suffer from impotence. Above the age of 60 about one of three are no longer able to achieve a suitable erection.

There are several medical treatment alternatives currently available depending on the nature and cause of the impotence problem, such as therapy with Yohimbine, an Indian tree bark extract, thought to chemically stimulate the nerves in penis that control erections. Early reports indicate that normal erection is restored in 20-25 percent of the patients, but the

effect is disputable. Side effects may include dizziness, nausea, nervousness and headaches.

For some men with low male hormone (testosterone) levels treatment with testosterone injections or pills may be beneficial. However, most patients do not have low testosterone levels and will not benefit from supplemental hormones. The side effects of testosterone treatment are several.

In recent years patients with erectile dysfunction of various origin have been treated by intracorporeal injection of various drugs. One such medicament is papaverin, which in small amounts dilates the arterial blood vessels and decreases the venous drainage (Virag R., Intracavernous injection of papaverin for erectile failure. Letter to the editor. Lancet 1982; 2:938). Brindley, G.S. describes in Brit. J. Psychiat. (1983), 143, 332-337 a new technique for investigating and treating erectile impotence by intracavernous self-injection of small doses of phenoxybenzamine or phentolamine. The doses as used for intracorporeal injection are about 2-10 mg of phenoxybenzamine and about 0.5-1.5 mg of phentolamine.

The side effects of self-injection of medication are the risk of infection, bruises, fibrosis and scarring with permanent changes inside the penis. There is also a risk of painful longstanding erection (Priapism).

It is further known that intravenous or intramuscular injection of phentolamine in moderate doses can cause an excessive fall in blood-pressure due to peripheral vasodilatation which puts the patient into a state of circulatory shock.

Experimentally it has been shown in some cases that cutaneous application of nitroglycerine paste to some extent can enhance the quality of erection.

Further, surgical implantation of penile prosthesis have been performed when simpler treatments are unsuccessful. However,

all surgical penile prosthetic implants carry a high risk of infection. Other complications of surgery include temporary urinary retention, pain, bleeding, scarring, mechanical failure and extrusion of the implant.

Therefore, the objects of the invention was to provide a method and a composition for the treatment of erectile dysfunction, which should be non-invasive, easy to use, have no significant side effects (short or longterm), be reasonably cheap, give a penile rigidity sufficient for vaginal penetration during a suitable time (20-30 minutes), be self-limiting, i.e. it should not be possible to overuse the drug(s) by taking more than one dose at a time (to avoid the risk of priapism).

These objects are achieved by a lipophilic active substance composition and its use in a method of treating erectile dysfunction by administration thereof, optionally together with a hydrophilic vehicle and optionally an antibacterial agent into the urethra according to the characterizing part of claims 1 and 19, respectively.

Hitherto it has been commonly believed that the urethral mucosal membrane does not allow transport of molecules across the same as waste products are transported via the urinary tract. Surprisingly and against all theories we have discovered that it is possible to administer pharmacologically active substances via the urethral mucosa into the corpora cavernosa of the human penis.

Previously, drugs of different nature than those of the present invention have been administered to the urethra for purposes of local disinfection and prophylaxis against venereal diseases and to induce local anesthesia. Administration of drugs into the urethra to reach the corpora cavernosa and to achieve effect has not been performed previously since the fact that this could be achieved was not known until the present invention.

Psychological erectile dysfunction is, at least partially, caused by an increased sympathetic tone that prevents the activation of the erection mechanism in the corpora cavernosa. Therefore, as mentioned above, one approach has been to inject an  $\alpha$ -receptor blocker, such as phentolamine and phenoxybenzamine, intracorporeally. However, injection of phentolamine only gives a short lasting erection while phenoxybensamine has a long duration but is believed to have severe side effect and presents a number of risks.

By experimental results we have found that when phentolamine is administered in an amount of 10-200 mg, preferably 50-60 mg per urethra in a volume of 1-6 ml, in general 2-3 ml, a full and satisfactory erection occurs without any obvious systemic side effects. (The dose used for intracorporeal injection of phentolamine is 0.5-1,5 mg.) The same desired results can also be achieved using phenoxybenzamine in high doses, 50-300 mg, preferably 100-150 mg per urethra, compared to the dose used for intracorporeal injection which is above about 2-10 mg. Another well suited  $\alpha$ -receptor blocker candidate for this purpose is prazosine in an amount of about 20-200 mg, preferably 30-70 mg. Other  $\alpha$ -receptor blockers might also be suitable.

According to our invention a large dose of the active substance is administered, preferably instilled, into the urethra and the slow uptake via the urethral mucosa to the corpora cavernosa gives a longer effect than the intracorporeal injections according to prior art.

Moreover, the active substance administered according to the present invention can also comprise other  $\alpha_1$  and  $\alpha_2$ -blocking agents and vasoactive intestinal polypeptide, prostaglandins, preferably PGE<sub>1</sub>, PGE<sub>2</sub> and PGF<sub>2</sub>, and nitroglycerine. The active substances must fulfil all the above listed objects of the present invention and also, which is very important, be fat soluble in order to pass through the mucosal membrane of the urethra.

When nitroglycerine is used as the active substance it should be administered in a dose not exceeding 5 mg per urethra because of the risk of blood-pressure fall. The dose range according to the invention is 0.5-5 mg, preferably 0.5-2,5 mg. This dose, however, is very high compared to the dose of nitroglycerine normally given to Angina pectoris patients which is 0.25 mg to 0.5 mg.

The present invention also provides compositions containing two or more of the active substances, i.e. two or more of the  $\alpha$ -receptor blockers, vasoactive intestinal polypeptide, prostaglandins and nitroglycerine, due to their different affinity for the  $\alpha$ -receptor blockers  $\alpha_1$  and  $\alpha_2$ . Such compositions are e.g. phentolamine and nitroglycerine, phenoxybenzamine and nitroglycerine, prazosine and nitroglycerine, all in the dose stated above. Furthermore, for possible synergistic effects phentolamine + phenoxybenzamine and phentolamine + prazosine and phenoxybenzamine and prazosine, respectively, can be administered together with nitroglycerine.

The purpose of the combination between  $\alpha$ -receptor(s) and nitroglycerine is that nitroglycerine gives a synergistic effect with  $\alpha$ -receptor blockers in that it obstructs sympathetic due to a local sympaticolytical effect and causes vasodilatation via a mechanism different from that of  $\alpha$ -receptor blockers. Nitroglycerine entails more rapid absorption and therefore gives an earlier effect.

Moreover, the invention also comprises a composition which in addition to the fat soluble active substance(s) comprises a hydrophilic vehicle and optionally an antibacterial agent. The purpose of the hydrophilic vehicle, such as macrogols and/or fat-free cream or ointment bases, is not only to control the uptake via the urethral membrane into the corpora cavernosa and keep the active substance(s) in the urethra but also presumably to enhance the uptake or passage of the urethral mucosa by forcing the fat soluble substances into the corpora cavernosa due to the fact that the vehicle is hydrophilic and

the fat soluble active substance(s) tend(s) to migrate to and through the membrane lipids rather than to stay in the hydrophilic environment. Thus, the purpose of the combination of the lipophilic active substance(s) and the hydrophilic vehicle is keeping the receptors activated (blocked) in a controlled way and under a longer period of time.

The invention will now be described by way of an example with reference to the accompanying drawing.

#### Example

Figure 1 is a graph showing the principles of the relationship between amount of phentolamine on the vertical axis and the duration of time on the horizontal axis. The patient was initially given 60 mg of the  $\alpha$ -receptor blocker phentolamine administered into the urethra and thereafter the penile rigidity was checked. During the peak of the curve, between 30 and 70 minutes from the administration of the active substance, full erection was achieved. The level of phentolamine needed to achieve full erection is shown by the dotted line in Fig. 1. The peak area above the dotted line is divided into two sections showing the amount of phentolamine assumed to be metabolized in the corpora cavernosa and the amount of phentolamine assumed to leak to the systemic circulation, respectively. Thus, the erection achieved by administration of phentolamine according to the present invention is considerably longer than the time period achieved with injections according to prior art.

It is assumed that the transport capacity of the urethral mucosa only slightly exceeds the capability of the corpora cavernosa to metabolize phentolamine. The abundant phentolamine, i.e. above the dotted line in Fig. 1 is mainly metabolized locally in the corpora cavernosa and only a minor part is assumed to leak to the systemic circulation. If a lower dose of phentolamine is used the rate of transportation over the urethral mucosa will be less than the rate of metaboli-



zation in the corpora cavernosa and therefore a sufficient number of  $\alpha$ -receptors will not be activated to achieve a full erection. A dose as high as 200 mg is possible, but the preferred range is between 50-60 mg, considering the risk of circulatory shock.

Thus, the present invention provides a new method, a composition and use thereof for the treatment of erectile dysfunction avoiding the prior art drawbacks and giving an opportunity for millions of impotent men to have a sex life that is as close to normal as possible.

Table 1 shows the results of tests to treat impotence in cystectomized patients by the application of different substances per urethra.

TABLE I  
RESULTS OF TESTS TO TREAT IMPOTENCE IN CYSTECTOMIZED PATIENTS BY THE APPLICATION OF DIFFERENT SUBSTANCES PER URETHRAM

Substances	No. of patients	Doses	Results
Verapamil	1	10 mg	0
Verapamil	1	15 mg	0
Salbutamol	1	1,6 mg	0
Terbutalin	1	1,0 mg	+
Papaverine	2	100 mg	0
Papaverine	1	210 mg	+
Phentolamine	2	10 mg	+
Phentolamine	1	10 mg	++
Phentolamine	1	60 mg	+++ (not cystectomized)
Phenoxybenzamine	1	50 mg	+
Phenoxybenzamine	1	50 mg	++
Nitroglycerin	1	5 mg	+
Phentolamine + nitroglycerin	2	10 mg + 2,5 mg	++
Phentolamine + nitroglycerin	4	20 mg + 2,5 mg	++
Phentolamine + nitroglycerin	1	20 mg + 5 mg	++
Phentolamine + nitroglycerin	1	20 mg + 5 mg	++(+)
Phentolamine + nitroglycerin	3	30 mg + 2,5 mg	++
Phentolamine + nitroglycerin	1	30 mg + 2,5 mg	++(+)
Phentolamine + nitroglycerin	1	30 mg + 5 mg	++
Phentolamine + nitroglycerin	1	30 mg + 5 mg	++(+)
Phentolamine + nitroglycerin	3	40 mg + 2,5 mg	++

cont.

cont.

**SUBSTITUTE SUB**

cont.

Substances	No. of patients	Doses	Results
Phenoxybenzamine + nitroglycerin	1	50 mg + 1,5 mg	+
Phenoxybenzamine + nitroglycerin	1	50 mg + 1,5 mg	++
Phenoxybenzamine + nitroglycerin	1	100 mg + 1,5 mg	++
Phenoxybenzamine + nitroglycerin	1	100 mg + 1,5 mg	++(+)
Phentolamine + Phenoxybenzamine + nitroglycerin	1	10 mg + 50 mg + 1,5 mg	++
Phentolamine + Phenoxybenzamine + nitroglycerin	1	10 mg + 100 mg + 1,5 mg	++
Phentolamine + Phenoxybenzamine + nitroglycerin	1	20 mg + 50 mg + 2,5 mg	+
Phentolamine + Phenoxybenzamine + nitroglycerin	1	30 mg + 50 mg + 1,5 mg	++

n = 39

Summary of scores: 5 = 0; 8 = +; 21 = ++; 5 = +++

In 33 patients the treatment was given in fluid-form, while in 6 patients the substances were dissolved in ointment.

Three patients who were given a dose for use at home reported that they succeeded in completing intercourse.

Side-effekts were seen in 12 patients. Four patients experienced a short-lasting drop in blood pressure, all of them had had a high nitroglycerin dose. Eight patients developed local irritation. In 7 of these the irritation was caused by the alcohol in which the nitroglycerin was dissolved. In one patient with local irritation concentrated phentolamine was used (30 mg/ml).

All 5 patients with the effect-score ++(+) and most of those with score ++ had a penile rigidity that to our judgement was sufficient for vaginal penetration. Thus these tests indicate that per urethram treatment of ED can be useful.

## CLAIMS

1. A composition for the treatment of erectile dysfunction via urethra, comprising a lipophilic active substance dispersed in a hydrophilic vehicle, such as macrogols or a fat-free cream or ointment base and optionally an antibacterial agent.
2. A composition according to Claim 1, wherein the active substance is selected of the group consisting of  $\alpha$ -receptor blockers, vasoactive intestinal polypeptide, prostaglandins and nitroglycerine.
3. A composition according to Claim 2, wherein the  $\alpha$ -receptor blockers are selected from the group consisting of phentolamine, phenoxybenzamine and prazosine.
4. A composition according to Claim 3, comprising phentolamine in an amount of at least 10 mg.
5. A composition according to Claim 4, comprising phentolamine in an amount of 10-200 mg, preferably 50-60 mg.
6. A composition according to Claim 3, comprising phenoxybenzamine in an amount of at least 50 mg.
7. A composition according to Claim 6, comprising phenoxybenzamine in an amount of 50-300 mg, preferably 100-150 mg.
8. A composition according to Claim 2, comprising nitroglycerine in an amount of at most 5 mg.
9. A composition according to Claim 8, comprising nitroglycerine in an amount of 0.5-5 mg, preferably 0.5-1.5 mg.
10. A composition according to Claim 1, comprising the active substance and optionally hydrophilic vehicle and optionally an antibacterial agent in a volume of 1-6 ml, generally 2-3 ml.

11. A composition according to Claim 2, wherein the active substance is selected of at least 2 members of the group consisting of  $\alpha$ -receptor blockers, vasoactive intestinal polypeptide, prostaglandins and nitroglycerine.
12. A composition according to Claim 1, wherein the active substance is selected of the group consisting of  $\alpha$ -receptor blockers and nitroglycerine.
13. A composition according to any of Claims 11 and 12, wherein the  $\alpha$ -receptor blocker is phentolamine.
14. A composition according to any of Claims 11 and 12, wherein the  $\alpha$ -receptor blocker is phenoxybenzamine.
15. A composition according to any of Claims 11, 12 and 13, wherein the  $\alpha$ -receptor blocker is both phentolamine and phenoxybenzamine.
16. A composition according to any of Claims 11 to 15, comprising the active substance in the amounts disclosed in Claims 4 to 9 and in the volume disclosed in Claim 10.
17. Use of a lipophilic active substance, optionally together with a hydrophilic vehicle and optionally an antibacterial agent for the preparation of a medicament for the treatment of erectile dysfunction by administration via urethra to corpora cavernosa.
18. Use according to Claim 17, wherein the active substance is selected of the group consisting of  $\alpha$ -receptor blockers, vasoactive intestinal polypeptide, prostaglandins and nitroglycerine.
19. Use according to Claim 18 of  $\alpha$ -receptor blockers selected from the group consisting of phentolamine, phenoxybenzamine and prazosine.

20. Use according to Claim 19 of phentolamine in an amount of at least 10 mg.
21. Use according to Claim 20 of phentolamine in an amount of 10-200 mg, preferably 50-60 mg.
22. Use according to Claim 19 of phenoxybenzamine in an amount of at least 50 mg.
23. Use according to Claim 22 of phenoxybenzamine in an amount of 50-300 mg, preferably 100-150 mg.
24. Use according to Claim 18 of nitroglycerine in an amount of at most 5 mg.
25. Use according to Claim 24 of nitroglycerine in an amount of 0.5-5 mg, preferably 0.5-1.5 mg.
26. Use according to Claim 17 of the active substance and optionally hydrophilic vehicle and optionally an antibacterial agent in a volume of 1-6 ml, generally 2-3 ml.
27. Use according to Claim 18 of at least 2 members of the group consisting of  $\alpha$ -receptor blockers, vasoactive intestinal polypeptide, prostaglandins and nitroglycerine.
28. Use according to Claim 18 and 27, wherein the active substance is selected of the group consisting of  $\alpha$ -receptor blockers and nitroglycerine.
29. Use according to Claim 28, wherein the  $\alpha$ -receptor blocker is phentolamine.
30. Use according to Claim 28, wherein the  $\alpha$ -receptor blocker is phenoxybenzamine.
31. Use according to Claim 28, wherein the  $\alpha$ -receptor blocker is both phentolamine and phenoxybenzamine.

32. Use according to any of Claims 27 to 31 of the active substance in the amounts disclosed in Claims 20 to 23 and the volume disclosed in Claim 26.

33. Use according to Claim 17, wherein the vehicle consists of e.g. macrogols and/or other fat free cream or ointment bases.

34. A method of treating erectile dysfunction wherein a lipophilic active substance, optionally together with a hydrophilic vehicle and optionally an antibacterial agent is administered into the urethra.

35. A method according to Claim 34, wherein the active substance is selected of the group consisting of  $\alpha$ -receptor blockers, vasoactive intestinal polypeptide, prostaglandins and nitroglycerine.

36. A method according to Claim 35, wherein the  $\alpha$ -receptor blockers are selected from the group consisting of phentolamine, phenoxybenzamine and prazosine.

37. A method according to Claim 34 and 36, wherein phentolamine is administered in an amount of at least 10 mg.

38. A method according to Claim 37, wherein phentolamine is administered in an amount of 10-200 mg, preferably 50-60 mg.

39. A method according to Claim 34 and 36, wherein phenoxybenzamine is administered in an amount of at least 50 mg.

40. A method according to Claim 39, wherein phenoxybenzamine is administered in an amount of 50-300 mg, preferably 100-150 mg.

41. A method according to Claim 35, wherein nitroglycerine is administered in an amount of at most 5 mg.

42. A method according to Claim 34 and 41, wherein nitroglycerine is administered in an amount of 0.5-5 mg, preferably 0.5-1.5 mg.

43. A method according to Claim 34, wherein the active substance and optionally the hydrophilic vehicle and optionally an antibacterial agent is administered into the urethra in a volume of 1-6 ml, generally 2-3 ml.

44. A method according to Claim 35, wherein the active substance is selected of at least 2 members of the group consisting of  $\alpha$ -receptor blockers, vasoactive intestinal polypeptide, prostaglandins and nitroglycerine.

45. A method according to Claims 35 and 44, wherein the active substance is selected of the group consisting of  $\alpha$ -receptor blockers and nitroglycerine.

46. A method according to Claim 45, wherein the  $\alpha$ -receptor blocker is phentolamine.

47. A method according to Claim 45, wherein the  $\alpha$ -receptor blocker is phenoxybenzamine.

48. A method according to Claim 45, wherein the  $\alpha$ -receptor blocker is both phentolamine and phenoxybenzamine.

49. A method according to any of Claims 44 to 48, wherein the active substances are administered in the amounts disclosed in Claims 37 to 42 and in the volume disclosed in Claim 43.

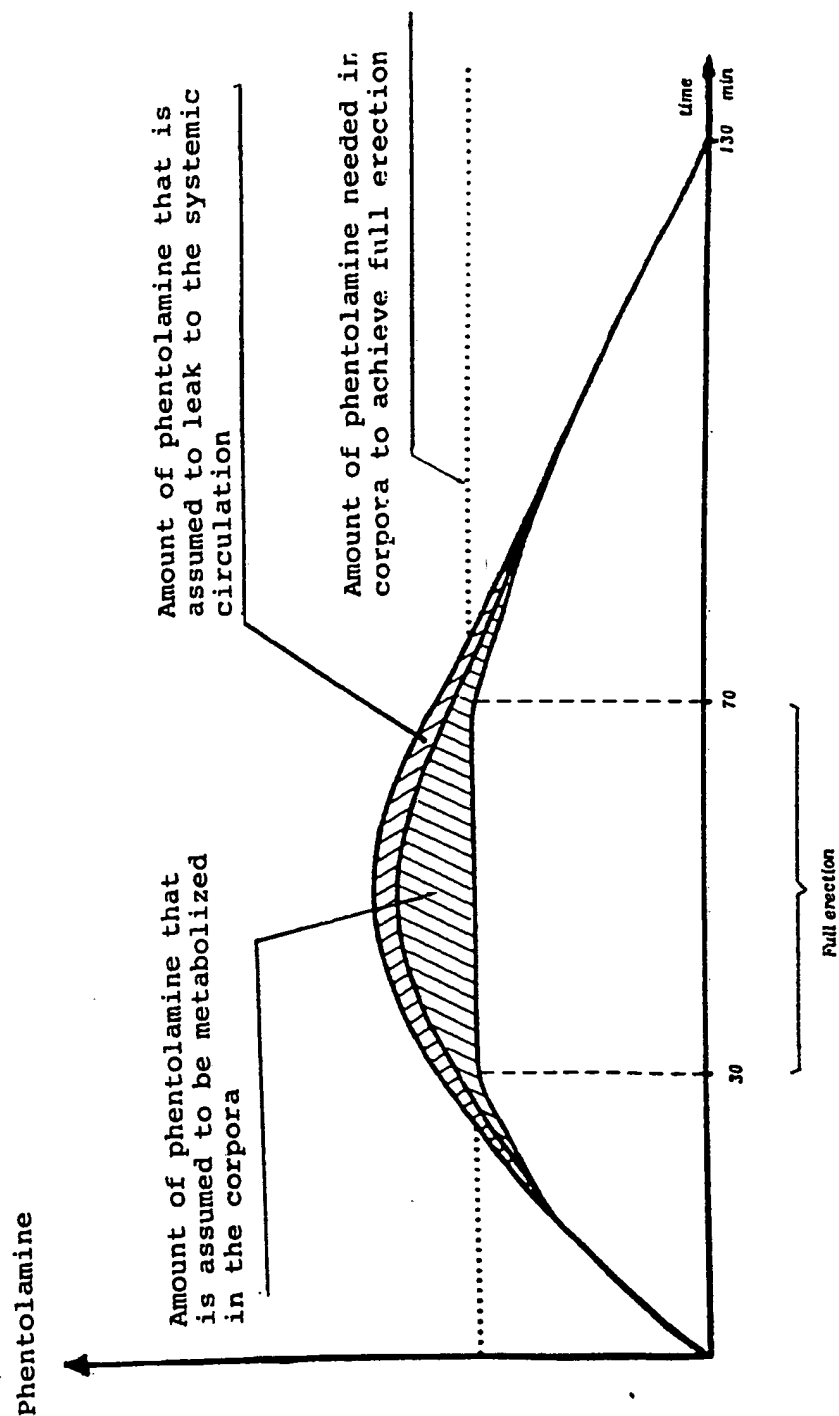
50. A method according to any of the preceding claims, wherein the vehicle consists of e.g. macrogols and/or other fat free cream or ointment bases.

51. A method according to any of the preceding claims, wherein the active substance is administered by instillation.



1/1

FIGURE 1



# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE89/00462

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>8</sup> According to International Patent Classification (IPC) or to both National Classification and IPC A 61 K 9/06, A 61 K 9/00//A 61 K 31/135, 31/19, 31/21																				
<b>II. FIELDS SEARCHED</b> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Minimum Documentation Searched <sup>7</sup></div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 30%; border-bottom: 1px solid black;">Classification System</th> <th style="border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="padding: 5px;">IPC 5</td> <td style="padding: 5px;">A 61 K</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black; margin: 5px 0;">Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched <sup>9</sup></div> <p style="padding: 5px;">SE, NO, DK, FI classes as above</p>			Classification System	Classification Symbols	IPC 5	A 61 K														
Classification System	Classification Symbols																			
IPC 5	A 61 K																			
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>6</sup></b> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; border-bottom: 1px solid black;">Category <sup>5</sup></th> <th style="border-bottom: 1px solid black;">Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup></th> <th style="width: 15%; border-bottom: 1px solid black;">Relevant to Claim No. <sup>13</sup></th> </tr> <tr> <td style="vertical-align: top; padding: 5px;">X Y</td> <td style="padding: 5px;">EP, A, 0 266 968 (G.G. COHEN ET AL.) 11 May 1988 see especially p. 1 line 38 - p. 2 line 6 &amp; JP, 63132825</td> <td style="vertical-align: top; padding: 5px;">1, 17 2-16, 18-33</td> </tr> <tr> <td style="vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">Urologic Clinics of North America, vol. 14, no. 2, May 1987, I.R. Malloy et al: "Pharmacological treatment of impotence", pages 297-305, see pages 303-4</td> <td style="vertical-align: top; padding: 5px;">2-16, 18-33</td> </tr> <tr> <td style="vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">Acta Physiol. Scand., vol. 100, February 1977, E. Klinge et al: "Comparative study of some isolated mammalian smooth muscle effectors of penile erection", pages 354-67, see the whole document</td> <td style="vertical-align: top; padding: 5px;">2-16, 18-33</td> </tr> <tr> <td style="vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">The Journal of Urology, vol. 134, December 1985, H. Hedlund et al: "Contraction and relaxation induced by some prostanoids in isolated human penile erectile tissue and cavernous artery", pages 1245-1250, see the whole document</td> <td style="vertical-align: top; padding: 5px;">2-16, 18-33</td> </tr> <tr> <td colspan="3" style="text-align: right; padding: 5px;">.../...</td> </tr> </table> <div style="font-size: small; padding: 5px;"> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>5</sup> Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"A" document member of the same patent family</p> </div> </div> </div>			Category <sup>5</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>	X Y	EP, A, 0 266 968 (G.G. COHEN ET AL.) 11 May 1988 see especially p. 1 line 38 - p. 2 line 6 & JP, 63132825	1, 17 2-16, 18-33	Y	Urologic Clinics of North America, vol. 14, no. 2, May 1987, I.R. Malloy et al: "Pharmacological treatment of impotence", pages 297-305, see pages 303-4	2-16, 18-33	Y	Acta Physiol. Scand., vol. 100, February 1977, E. Klinge et al: "Comparative study of some isolated mammalian smooth muscle effectors of penile erection", pages 354-67, see the whole document	2-16, 18-33	Y	The Journal of Urology, vol. 134, December 1985, H. Hedlund et al: "Contraction and relaxation induced by some prostanoids in isolated human penile erectile tissue and cavernous artery", pages 1245-1250, see the whole document	2-16, 18-33	.../...		
Category <sup>5</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>																		
X Y	EP, A, 0 266 968 (G.G. COHEN ET AL.) 11 May 1988 see especially p. 1 line 38 - p. 2 line 6 & JP, 63132825	1, 17 2-16, 18-33																		
Y	Urologic Clinics of North America, vol. 14, no. 2, May 1987, I.R. Malloy et al: "Pharmacological treatment of impotence", pages 297-305, see pages 303-4	2-16, 18-33																		
Y	Acta Physiol. Scand., vol. 100, February 1977, E. Klinge et al: "Comparative study of some isolated mammalian smooth muscle effectors of penile erection", pages 354-67, see the whole document	2-16, 18-33																		
Y	The Journal of Urology, vol. 134, December 1985, H. Hedlund et al: "Contraction and relaxation induced by some prostanoids in isolated human penile erectile tissue and cavernous artery", pages 1245-1250, see the whole document	2-16, 18-33																		
.../...																				
<b>IV. CERTIFICATION</b> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of the Actual Completion of the International Search</td> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of Mailing of this International Search Report</td> </tr> <tr> <td style="text-align: center; padding: 5px;">1989-10-31</td> <td style="text-align: center; padding: 5px;">1989-11-10</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 5px;">International Searching Authority</td> <td style="border-bottom: 1px solid black; padding: 5px;">Signature of Authorized Officer</td> </tr> <tr> <td style="text-align: center; padding: 5px;">Swedish Patent Office</td> <td style="text-align: center; padding: 5px;">Niklas Forslund</td> </tr> </table>			Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	1989-10-31	1989-11-10	International Searching Authority	Signature of Authorized Officer	Swedish Patent Office	Niklas Forslund										
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report																			
1989-10-31	1989-11-10																			
International Searching Authority	Signature of Authorized Officer																			
Swedish Patent Office	Niklas Forslund																			

## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. ☒ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE <sup>1</sup>

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☒ Claim numbers 34-51 because they relate to subject matter not required to be searched by this Authority, namely:

Method for treatment of the human body by therapy  
(see PCT-rule 39.1(iv)).

2. ☐ Claim numbers ..... because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim numbers ..... because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 8.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING <sup>2</sup>

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

## Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
Y	Urol. Res., vol. 16, no. 4, 1988, G. Brabanti et al: "Relaxation of isolated corpus cavernosum induced by smooth muscle relaxant drugs", pages 299-302, see the whole document	2-16, 18-33
Y	EP, A, 0 149 254 (THE RESEARCH FOUNDATION OF STATE UNIVERSITY OF NEW YORK) 24 July 1985 see page 6 lines 5-7 and example 1 & US, 4725576	2-16, 18-33
Y	Dialog Information Services, file 351, WPI 81-89, accession no. 3534576, WPI Acc.no. 84-180160/29 "Stable aq. compsn. contg. ligstylide uses alcohol e.g. ethanol as stabilizer", & JP, A, 59101478 (SAN STARK KK) 12 June 1984, abstract	